Key to the species of the *Pachyprotasis rapae* group (Hymenoptera: Tenthredinidae) in China with descriptions of four new species

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Abstract: An updated key to the species-groups of *Pachyprotasis* is provided, proposing the *P. melanosoma* group addition for species formerly placed in the *P. rapae* group. A key to the species of the *Pachyprotasis rapae* group from China is provided, and four new species are described: *P. motuoensis* Zhong, Li & Wei sp. nov., *P. paraneixiangensis* Zhong, Li & Wei sp. nov., *P. prismatiscutellum* Zhong, Li & Wei sp. nov. and *P. zejiani* Zhong, Li & Wei sp. nov. The subspecies *P. antennata lui* is raised to species *P. lui*.

Key words: Oriental; Palaearctic; sawflies; Symphyta; taxonomy

中国方颜叶蜂属黑足方颜叶蜂种团厘订并记四新种（膜翅目：叶蜂科）

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摘要：本文更新了方颜叶蜂属分种团检索表，将黑足种团 *P. rapae* group 中体色大部分为黑色种类抽出，单独建立黑体种团 *P. melanosoma* group。编制了黑足种团中国已知种分种检索表，并记述了 4 个新种：墨脱方颜叶蜂 *P. motuoensis* Zhong, Li & Wei sp. nov.，拟内乡方颜叶蜂 *P. paraneixiangensis* Zhong, Li & Wei sp. nov.，棱盾方颜叶蜂 *P. prismatiscutellum* Zhong, Li & Wei sp. nov. 和泽建方颜叶蜂 *P. zejiani* Zhong, Li & Wei sp. nov.。将合叶子方颜叶蜂刘氏亚种 *P. antennata lui* 提升为种：刘氏方颜叶蜂 *P. lui*。

关键词：东洋界；古北界；叶蜂；广腰亚目；分类

Introduction

Pachyprotasis Hartig, 1837 is chiefly distributed in the Palaearctic and northern Oriental Regions. Worldwide 215 species have been recognized (Taeger *et al*. 2010; Zhong & Wei 2010a, b 2012; Zhong *et al*. 2015). For China and the Myanmar-Yunnan frontier, 134 species

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① Corresponding authors, E-mails: lizejian2006@163.com; weimc@126.com have been listed (Malaise 1945; Wei *et al*. 2006; Zhong & Wei 2006, 2007, 2009, 2010a, b, 2012; Zhong *et al*. 2015). Saini *et al*. (2006) and Saini (2007) reported 65 species from India. Naito & Inomata (2006) reported that 38 species occur in Japan.

Zhong & Wei (2010a), provided a key to separate the *Pachyprotasis rapae* group from other species-groups of *Pachyprotasi*s. Here we subdivide the *P. rapae* group into two groups, i.e., the *P. rapae* group in a narrower sense and the *P. melanosoma* group. The *P*. *rapae* group now includes 61 species, 33 of which have been recorded in China. Here we describe 4 new species of the group, one of them from Hunan, one from Tibet, one fromYunnan and one from Sichuan and Qinghai Provinces.

Material and methods

The specimens were examined with a Motic-DM-143 stereomicroscope. Images of adults were taken with a NikkorAF Micro 60mm f/2.8D lens attached to a Nikon D700 digital camera; images of the male of *P. prismatiscutellum* were taken with a Leica DFC450 C camera attached to a Leica M405 C stereomicroscope. Lighting was from the high diffuse dome illumination Leica LED5000 HDI. Images of faces, heads and pleura were taken with a Nikon D700 attached to a LeicaSSAPO stereomicroscope; images of genitalia were taken with a Moticam 5000 attached to a Motic BA 600Mot microscope. Composite images with an extended depth of field were created from stacks of images using the software Helicon Focus (© HeliconSoft). All images were further processed with Adobe Photoshop CS 11.0.

Terminology of sawfly genitalia follows Ross (1945), Viitasaari (2002) and Zhong & Wei (2012) and wing venation follows Zhong & Wei (2012).

For each species, the distribution is presented on a map based on materials we studied, or on data cited in the references. The distribution maps were prepared using Arcview-GIS 3.3.

Most specimens examined during this study are deposited in the Insect Collection of the Central South University of Forestry and Technology, Changsha, China (CSCS); some specimens are deposited in the Senckenberg Deutsches Entomologisches Institut, Müncheberg, Germany (SDEI).

Taxonomy

Updated key to the species-groups of *Pachyprotasis*

Zhong & Wei (2010a) published a key for the separation of species-groups in *Pachyprotasis*. For material which would run into the *Pachyprotasis rapae* group as defined by Zhong & Wei (2010a), here we distinguish the *P. melanosoma* group. Material associated with the *P. rapae* group in this narrower sense can be identified with the following key. These species-groups do not necessarily form groups of closely related species but they serve as a tool for species identification.

1. Antennae black or red brown, sometimes with a white stripe along the entire underside························2

-. Apex of antennae white or with white ring, the apex of the two apical flagellomeres sometimes black, and the underside of the white articles sometimes striped with black; articles 3–5 black, rarely and only in the male, pale along the underside·· *P. formosana* group

2. General color black and white or yellow, without red except on legs······3

-. General color of abdomen at least red-yellow or brown······*P. indica* group

3. Stigma dark brown to black, rarely with pale anterior margin but then the hind legs more or less red······4

-. Stigma in life green, in dry specimens mostly sordid yellow; in the male darker, fulvous or light brown, but still transparent······*P. pallidistigma* group

4. Wings not infuscated······5

-. Forewing uniformly infuscated, with infuscated apex or with infuscated band below stigma······*P. parapeniata* group

5. Hind legs black or pale yellow without red······6

-. Hind legs more or less red, red-brown, or red-yellow (in the male, sometimes only traces of that color at the base of tibiae or apex of femora)······*P. flavipes* group

6. Hind tarsi mostly black, at least each apex of tarsomeres black······7

-. General color of hind tarsi white or yellow, sometimes base of tarsomere 1, tarsomere 2 and apex of tarsomere 5 black······*P. opacifrons* group

7. Body dorsally black with large yellow-white spots, ventrally yellow-white, if black, then always with broad yellow-white bands, or at least basal 2/3 of hind femur yellow white; hind leg yellow-white, at most apical third of hind femur, most of hind tibia and tarsus black ······*P. rapae* group

-. Body black, dorsum and venter only with few small white spots; hind leg black, at most apex of coxa, trochanter and basal third of femur white······*P. melanosoma* group

Key to species of *Pachyprotasis rapae* group from China

1. Mesepisternum with medial black vertical band dividing median of mesepisternum into two separated white spots (Figs. 1–4)······2

-. Mesepisternum yellow, black, or with horizontal black band ventrally, without black vertical band separating white spots (Figs. 5–34) ······4

2. Dorsum of abdomen entirely black, or only center of each tergum with triangular yellow spot; pore line and ventral outline of ovipositor more or less at perpendicular angle (Figs. 66, 67) ······3

-. Posterior margin of each tergum with broad and continuous yellow-white band; pore line and ventral outline of ovipositor enclosing an acute angle (Fig. 63). China (Tibet) ······*P. motuoensis* Zhong, Li & Wei **sp. nov.**

3. Mesepinsternum with complete and broad black horizontal and vertical band (Figs. 2, 3); dorsum of abdomen completely black, without distinct yellow-white spot; base of each serrula strongly elevated (Fig. 66). China (Gansu, Heilongjiang, Hubei, Jilin, Liaoning, Qinghai, Sichuan); India; Mongolia; Siberia; North America; Europe······*P. rapae* (Linnaeus)

-. Mesepinsternum only with short and narrow black horizontal and vertical band (Fig. 4); dorsum of abdomen with distinct triangular spot on each tergum; base of each serrula slightly elevated (Fig. 67). China (Gansu, Tibet)······*P. semenowi* Jakowlew

4. Mesoscutellum strongly elevated in lateral view (Fig. 38), elevation with medial notch (Figs. 35, 36) ······5

-. Mesoscutellum flat (Fig. 39) or weakly elevated (Fig. 40) in lateral view, elevation without medial notch (Fig. 37) ······6

5. Tergum 1 completely yellow-white; metafemur yellow-white except narrowly black base; lower mesepisternum with broad longitudinal black band. China (Yunnan)······*P. prismatiscutellum* Zhong, Li & Wei **sp. nov.**

-. Tergum 1 black, hind margin yellow-white; apical 2/5 of metafemur black; lower mesepisternum without black band; China (Guizhou, Henan, Hubei, Sichuan, Shaanxi)······ *P. sulciscutellis* Wei & Zhong

6. Lower mesepisternum with complete, broad, horizontal black band (Figs. 9–24), or mesepisternum and mesepimeron black, anteriorly sometimes with white spot (Figs. 5–8)······7

-. Lower mesepisternum without horizontal black band, or sometimes with narrow and short black band (Figs.

25–34)……………………………………………………………………………………………… 26

7. Mesepisternum yellow-white, lower mesepisternum with broad black band (Figs. 10, 11, 16–20, 22, 24), or mesepisternum black, center with horizontal yellow-white band, but not narrower than 1/4 of mesepisternum (Figs. 12–15, 21, 23) ……………………………………………………………… 8

-. Mesepisternum black, anterior part sometimes with yellow-white spot (Figs. 5–8); or mesepisternum black, center sometimes with horizontal yellow-white band, but not broader than 1/8 of mesepisternum (Fig. 9)…… ……………………………………………………………………………………………………22

8. Mesepisternum without punctures, or with rather scattered punctures, distance between punctures much wider than diameter of punctures ……………………………………………………………………9

-. Mesepisternum with punctures, distance between punctures much narrower than diameter of punctures…· 10

9. Punctures on and around the frontal area shallow and mostly more scattered and less distinct than those on mesonotum (according to Malaise 1945). China (Fujian, Guizhou, Hunan, Jilin, Taiwan, Shaanxi, Zhejiang); Japan; E. Russia ……………………………………………………………*P. erratica* F. Smith

-. Head impunctate, punctures on thorax extremely minute (according to Malaise 1945). China (Sichuan)……… …………………………………………………………………… *P. erratica nitidifrons* Malaise

10. Punctures on and around frontal area dense, distance between punctures much narrower than diameter of punctures ……………………………………………………………………………………… 11

- Punctures on and around frontal area rather scattered, distance between punctures much wider than diameter of punctures. China (Hunan, Guangxi)……………………………………*P. breviserrula* Wei & Zhong

11. Posterior margins of all terga yellow-white, or some terga with yellow-white triangular middle spot on posteriorly…………………………………………………………………………………… 12

-. Posterior margins of most terga black, posteriorly without distinct yellow-white spot …………………… 17

12. Posterior margins of terga black, only some terga with medial triangular yellow-white spots posteriorly…… …………………………………………………………………………………………………… 13

-. Posterior margins of all terga yellow-white. China (Guizhou) …………………………… *P. libona* Wei & Nie

13. Yellow-white on base of metafemur longer than 3/5 of metafemur……………………………………… 14

-. Yellow-white on base of metafemur shorter than 2/5 of metafemur. China (Guangdong, Guizhou, Hunan, Shaanxi)……………………………………………………………………………*P. wulingensis* Wei

14. Inner side of metacoxa with distinct black spot; base of each serrula distinctly elevated or not elevated…15

-. Inner side of metacoxa without black spot; base of each serrula slightly elevated. China (Guizhou)………… ……………………………………………………………………………………………*P. lini* Wei

15. Base of each serrula distinctly elevated, middle serrulae each with less than 7 distal denticles (Fig. 68); lateral mesoscutal lobe usually without yellow-white spot……………………………………………… 16

-. Base of each serrula not elevated, middle serrulae each with more than 15 distal denticles (Fig. 69); lateral mesoscutal lobe always with yellow-white spot. China (Gansu, Guangdong, Hebei, Henan, Shaanxi)……… ………………………………………………………………………………………… *P. tiani* Wei

16. Basal 1/2 of hind femur white; outer pronotum with white; white spots on vertex and lower mesepisternum narrow. China (Hunan, Sichuan); Japan……………………………………… *P. senjensis senjensis* Inomata

-. Basal 2/7 of hind femur white; outer pronotum without white; white spots on vertex and lower mesepisternum broad. China (Gansu, Henan, Shanxi)……………………*P. senjensis bandana* Wei & Zhong

17. Pectus black, without yellow-white spot (Figs. 14, 21) ……………………………………………… 18

-. Pectus yellow-white (Figs. 10, 17, 20, 22) …………………………………………………………… 19

18. Yellow-white horizontal band on lower mesepisternum narrower than black spot on upper mesepisternum (Fig. 21); basal half of metafemur yellow-white. China (Henan) ……………*P. songluanensis* Wei & Zhong

-. Yellow-white horizontal band on lower mesepisternum broader than black spot on upper mesepisternum (Fig. 14); basal 2/3 of metafemur yellow-white. China (Henan)…………………… *P. lineipediba* Wei & Zhong

19. Outer metafemur with black stripe along entire length ······ 20

-. Outer metafemur without black stripe on base ······ 21

20. Outer metacoxa with two separated black stripes; outer metatibia with white spot near apex; upper 1/2 of mesepisternum black. China (Henan) ······ *P. maculotibialis* Wei & Zhong

-. Outer metacoxa only with one black stripe; outer metatibia without white spot; upper 1/3 of mesepisternum black. China (Henan) ······ *P. bimaculofemorata* Wei & Nie

21. Outer metacoxa with narrow black stripe; mesoscutellum not elevated, top flat; lateral mesoscutellum with shallow and minute punctures. China (Henan) ······ *P. sunae* Wei & Nie

-. Outer metacoxa white, without black stripe; mesoscutellum elevated, top rounded; lateral mesoscutellum without punctures; China (Jilin); Japan ······ *P. serii* Okutani

22. Flagellomere 1 longer than flagellomere 2 ······ 23

-. Flagellomere 1 shorter than flagellomere 2. China (Guangdong, Hubei, Hunan, Shaanxi) ······ *P. obscurodentella* Wei & Zhong

23. Body length shorter than 10 mm; metacoxa white, without black stripe; punctures on dorsum of head large, deep ······ 24

-. Body length longer than 10 mm; metacoxa with narrow black stripe; punctures on dorsum of head minute, shallow. China (Guizhou, Hebei, Henan, Hubei, Hunan, Shaanxi, Zhejiang) ······ *P. lineatella* Wei & Nie

24. Body length 7 mm; postocellar area 1.5 times wider than long ······ 25

-. Body length 8–9 mm; postocellar area 1.3 times wider than long. China (Gansu, Henan, Shaanxi, Shandong, Sichuan) ······ *P. caii* Wei

25. Mesepisternum without yellow-white medial band, at most anteriorly with small white spot; all of terga black, without yellow-white spot. China (Henan, Hubei, Shaanxi, Sichuan, Yunnan) ······ *P. melanogastera* Wei

-. Mesepistenum with yellow-white medial band; posterior part of terga 3–5 each with distinct yellow-white spot. China (Guizhou, Ningxia, Yunnan, Zhejiang) ······ *P. paramelanogastera* Wei

26. Dorsum of head with punctures ······ 27

-. Dorsum of head without punctures. Northeastern China; Mongolia; Siberia; Europe ······ *P. simulans* (Klug)

27. All of orbit yellow-white, vertex without black spot (Figs. 45, 46), terga 6–8 strongly and deeply concaved in middle (Figs. 43, 44) ······ 28

-. Lower inner orbit continues with lower hind orbit yellow-white, vertex black or with black spot (Figs. 47–49), terga not concaved in middle (Figs. 41, 42) ······ 29

28. Hind tibia with broad yellow-white ring near apex; black spot on front area small (Fig. 46); valviceps long triangular, widest close to middle (Fig. 71). China (Hunan) ······ *P. paraneixiangensis* Zhong, Li & Wei **sp. nov.**

-. Hind tibia without yellow-white ring near apex; black spot on front area large (Fig. 45); valviceps short triangular, widest in proximal half (Fig. 70). China (Henan) ······ *P. neixiangensis* Wei & Zhong

29. Hind tibia with yellow-white ring near apex; base of each hind tarsomere yellow-white, apex black ······ 30

-. Hind tibia without yellow-white ring near apex; hind tarsomere black, without white ······ 31

30. Hind coxa, trochanter and basal femur without black stipe on outer side; white spot on vertex quite broad (Fig. 47); pronotum yellow white except black center; lateral side of median mesoscutal lobe yellow-white. China (Gansu, Hebei, Heilongjiang, Henan, Hunan, Qinghai, Shaanxi); Mongolia; Japan; Russia; Europe ······ *P. antennata* (Klug)

-. Hind coxa, trochanter and femur striped with black along the entire outer side; white spot on vertex quite narrow (Fig. 48); pronotum black except yellow-white lower part; V-shaped spot on lateral side of median mesoscutal lobe yellow-white. China (Gansu, Hebei, Henan) ······ *P. lui* Wei & Zhong, 2008, stat. n.

31. Upper occiput yellow-white, only lower with faint black spot, tergum 1 yellow-white, with two separated

basal black spots. China (Sichuan)··········· *P. zejiani* Zhong, Li & Wei **sp. nov.**

-. Upper occiput and tergum 1 completely black, without white··········· 32

32. Mesepisternum with indistinct, shallow, and confluent punctures (according to Malaise 1945). China (Sichuan, Yunnan); Myanmar; India··········· *P. subcoreacea* Malaise

-. Mesepisternum with distinct scattered punctures, sometimes extremely small··········· 33

33. Punctures on mesepisternum large and deep, on an average the diameter of the punctures equal to or exceeding l/3 of the diameter of an ocellus, and distance between the punctures equal to or less than the diameter of each puncture··········· 34

-. Punctures on mesepisternum shallow and at least in the lower part smaller than 1/3 of the diameter of an ocellus, and mostly much more widely scattered··········· 37

34. Outer hind coxa and trochanter with black spots ··········· 35

-. Outer hind coxa and trochanter without black spots··········· 36

35. Terga mostly with middle spots on hind margins; mesepisternum pale, lower part with a broad horizontal spot or band; outer hind femur with black spot on base (according to Malaise 1945). China (Tibet); Yunnan-Myanmar frontier; India; Nepal··········· *P. albicincta albicincta* Cameron

-. Terga with complete pale spots on hind margins; mesepisternum black, in front with a sometimes wanting pale spot; outer hind femur without black spot on base (according to Malaise 1945). Yunnan-Myanmar frontier··········· *P. albicincta albitarsis* Malaise

36. Posterior half of mesepisternum and mesepimeron black; venter of abdomen black, hind margin of each sternum and each deflexed side of tergum pale (according to Malaise 1945). Yunnan-Myanmar frontier··········· *P. albicincta sinobirmanica* Malaise

-. Mesepisternum and mesepimeron quite black; the pale hind margins of sterna and the deflexed side of terga extremely narrow (according to Malaise 1945). Yunnan-Myanmar frontier··········· *P. albicincta nigripleuris* Malaise

37. Scutellum not elevated, flat above and with sharp lateral carina; postocellar area nearly 2 times wider than long; head smooth, almost impunctate; mesepisternum pale, lower with black horizontal band on the border of pectus (according to Malaise 1945). China (Guangxi, Hunan, Zhejiang); Yunnan-Myanmar frontier, India ··········· *P. gregalis* Malaise

-. Scutellum elevated, lateral carina rounded; postocellar area 1.5 times wider than long; face on and around the frontal area with isolated, shallow and rather fine punctures; mesepisternum quite pale, without black horizontal band··········· 38

38. Mesepisternum and mesepimeron, venter of abdomen quite pale; complete lateral border of the mesonotal middle lobe pale, the pale marking accordingly V-shaped; inner orbit pale, connecting the large spot on each temple with the pale underface; stripe along the hind femur reaching basally over the middle (according to Malaise 1945). China (Guizhou, Sichuan, Yunnan); Yunnan-Myanmar frontier······ *P. sellata sellata* Malaise

-. The upper part of mesepisternum and mesepimeron black, base of each sternum black; hind apex of the mesonotal middle lobe with pale marking arrow-shaped; inner orbit black, the pale temple spot isolated; the black stripe on the hind femora confined only to the extreme apex (according to Malaise 1945). Yunnan-Myanmar frontier··········· *P. sellata sagittata* Malaise

Pachyprotasis lui Wei & Zhong, 2008, stat. n.

Pachyprotasis antennata lui Wei & Zhong, 2008: 28.

Remarks. *Pachyprotasis lui* was described as a subspecies of *P. antennata* by Wei *et al.* (2008). Since the distribution ranges of the two taxa overlap in Gansu, Hebei and Henan, they cannot be regarded as subspecies of a single species. *Pachyprotasis antennata lui* is here raised to species level. Also the shapes of the white spots on the vertex and thorax are quite different between the two species.

Malaise (1945) described several subspecies of *P. albicincta* and *P. sellata* from the Yunnan-Myanmar frontier which need to be reconsidered, but this treatment is not in the focus of the present work. The inclusion of these subspecies in the key above follows Malaise (1945).

1. ***Pachyprotasis motuoensis* Zhong, Li & Wei sp. nov.** (Figs. 1, 50, 51, 60, 63)

Female (Figs. 50, 51). Body length 7 mm. Black, with yellow-white pattern as follows: labrum, clypeus except medial black spot, supraclypeal area, spot above base of each antenna, lower half of inner orbit continuing with hind orbit, narrow band on upper inner orbit continuing with oblique spot on temple, venter of antenna, anterior and posterior pronotum, anterior tegula, V-shaped spot on lateral side of median mesoscutal lobe, small medial spot on lateral mesoscutal lobe, mesoscutellar appendage, metascutellum, large medial horizontal band on mesepisternum (Fig. 1), posterior mesepimeron, upper half of metepisternum, posterior half of metepimeron, two large separated spots on center of pectus, posterior margins and deflexed lateral sides of all terga, most of tergum 10, posterior margins of all sterna, venter of valvifer 2. Legs yellow-white, with black pattern as follows: dorsum of all coxae, dorsum of fore and middle legs from basal 2/3 of femur to claw, apical 1/4 of metafemur, metatibia and metatarsus. Wings pale brown, pterostigma and veins black brown. Body hairs silver gray.

Labrum and clypeus polished, only with few shallow and minute punctures; punctures on dorsum of head minute and scattered, sculpture indistinct, shining; punctures on mesonotum smaller and denser than on dorsum of head, interspaces polished, with distinct oily luster; upper mesepisternum with coarse punctures, interspaces with distinct sculpture; punctures on lower mesepisternum minute, sculpture indistinct, strongly shining; mesepimeron with distinct and dense sculpture, slightly shining; punctures on metepisternum extremely shallow, minute and dense, luster indistinct; metepimeron polished, punctures shallow, minute and scattered, interspaces with oily luster; center of mesoscutellum polished without punctures, laterally with shallow and minute punctures, strongly shining; mesoscutellar appendage without punctures, sculpture distinct, strongly shining; abdominal terga polished, punctures absent, sculpture indistinct, shining; punctures on outer hind coxa extremely minute, indistinct.

Body hairs dense and long, 1.2 times diameter of median ocellus. Anterior margin of labrum truncate; clypeus truncately incised to 0.4 of its medial length, lateral lobe rather large; malar space 0.8 times diameter of median ocellus; inner margin of eyes slightly convergent downwards; supraantennal tubercle insignificant, frontal area not elevated, far below top of eyes in lateral view, frontal ridge lowly rounded; middle fovea indistinct, lateral fovea shallow; interocellar furrow shallow, postocellar furrow absent; postocellar area slightly elevated, 2 times wider than long, lateral furrow shallow and straight; head slightly narrowed behind eyes in dorsal view. Antenna shorter than combined length of thorax and abdomen, flagellomere 1 about 1.2 times longer than flagellomere 2. Mesoscutellum bluntly elevated, anterior part of lateral carina acute, mesoscutellar appendage with an acute middle carina. Hind tarsomere 1 as long as combined length of following 4 tarsomeres, claw with inner tooth as long as outer tooth. Vein cu-a in fore wing joining cell M at proximal 0.4, 2Rs as long as 1Rs, middle petiole of anal cell 0.5 times length of basal anal cell, 1.5 times length of vein R+M; petiole of anal cell in hind wing distinctly shorter than half length of vein cu-a.

Ovipositor sheath slightly shorter than hind tarsomere 1 in lateral view, valvula 3 acute at apex and as long as valvifer 2 in lateral view. Lancet with 18 annuli (Fig. 60), pore line and ventral outline of ovipositor enclosing an acute angle, base of each serrula not elevated, middle serrulae without basal denticle, with 7–9 distal denticles (Fig. 63).

Male. Unknown.

Holotype. ♀, **China**, Tibet, Motuo County, 60 K, 95º41.956′ E, 29º48.380′ N, alt. 2998 m, 20-VI-2009, Meicai WEI leg., CSCS.

Etymology. The specific epithet refers to Motuo, the type locality of the new species.

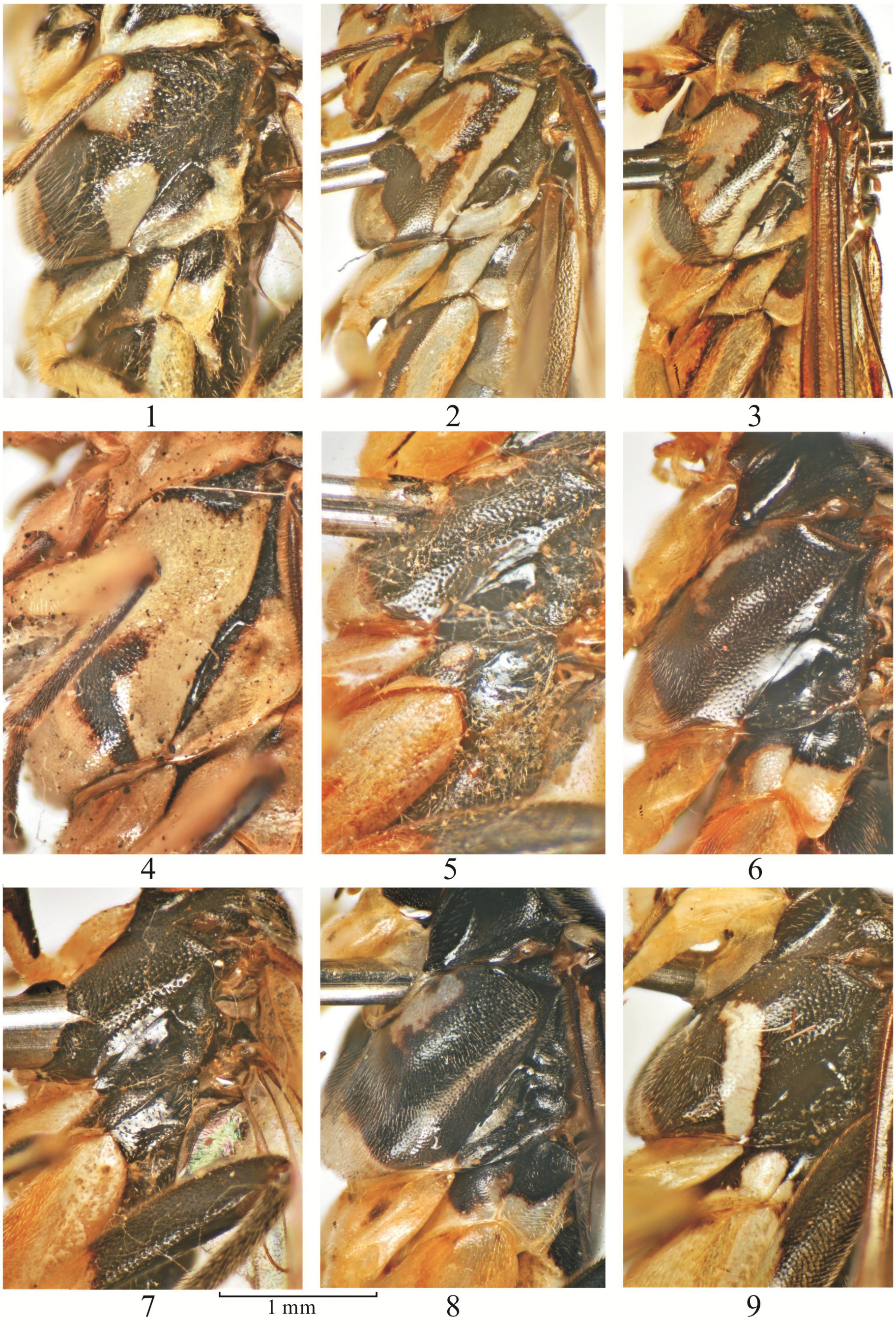
Distribution. China (Tibet).

Remarks. This species is close to *P. libona* in general appearance, in addition to the characters listed in the key, the following characters are characteristic for this species: body hairs long and dense; punctures on dorsum of head minute and scattered, sculpture indistinct; pectus with yellow-white spot; hind coxa yellow-white, outer side with large black spot. In latter species, body hairs short and sparse; punctures on dorsum of head large and dense, sculpture distinct; pectus black, without yellow-white spot; outer hind coxa without black spot.

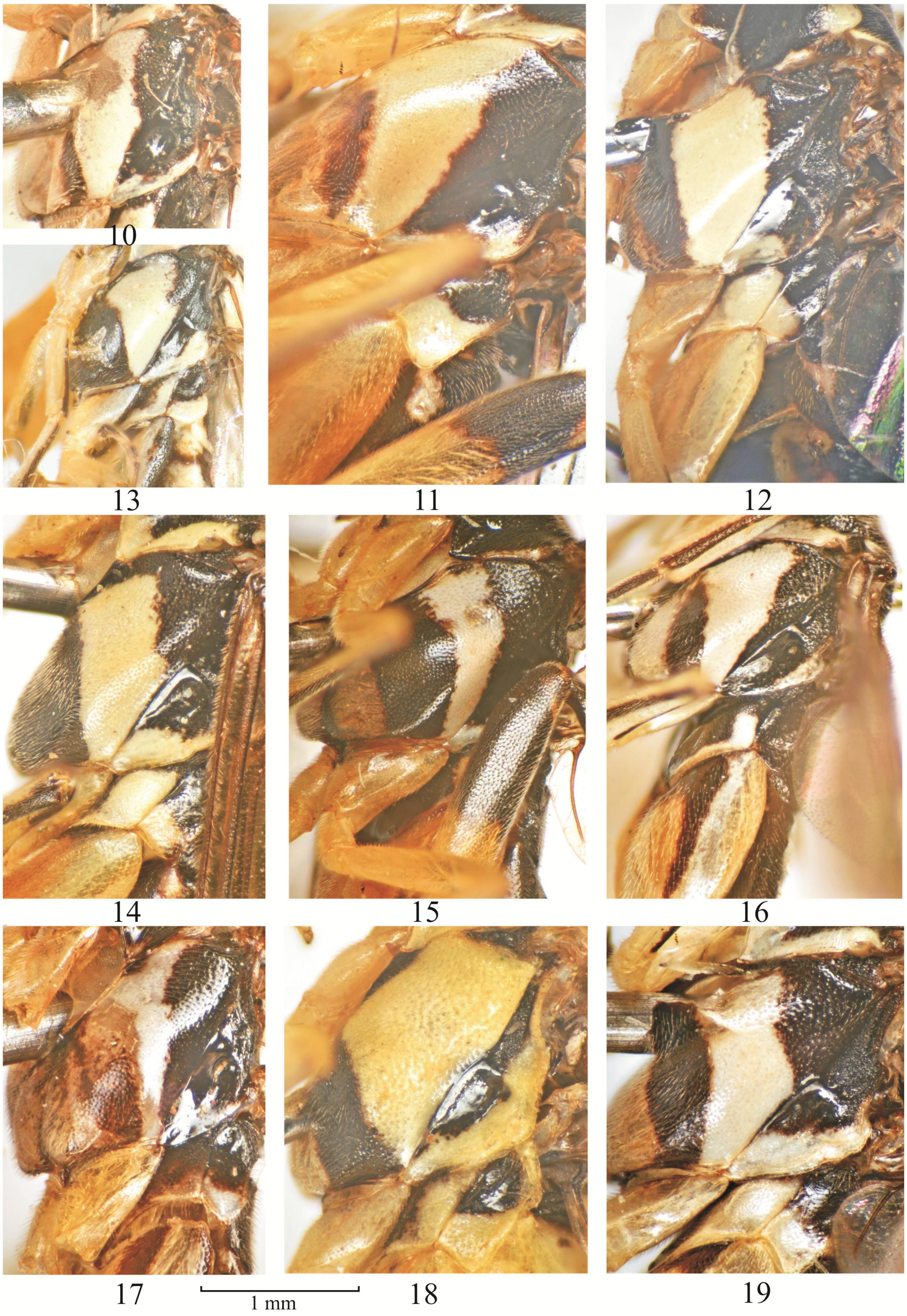
2. ***Pachyprotasis paraneixiangensis*** **Zhong, Li & Wei sp. nov.** (Figs. 44, 46, 52, 53, 71)

Male (Figs. 52, 53). Body length 10 mm. Head yellow-green, with black pattern as follows: posterior half of frontal area continuing with ocellar area, medial spot on upper occiput (Fig. 46), dorsum of scape, small spot on dorsum of pedicel, dorsal stripe from apical half of flagellomere 3 to flagellomere 5, an outer stripe on flagellomere 3–5, flagellomere 6–9 except a dark-brown ventral stripe; thorax yellow-green, with black pattern as follows: center of pronotum, large anteromedial spot on median mesoscutal lobe, lateral mesoscutal lobe except lateral margin and medial arrow-shaped spot, mesopostnotum, metascutum, large spot each on lateral part of metapostnotum, lower mesepimeron, pleural suture continuing with upper margin of mesepisternum, anterior part of metapleuron; dorsum of abdomen black-brown, with yellow-green pattern as follows: large medial triangular spot each on terga 1–5, posterior parts of terga 6–8; venter of abdomen yellow-green; legs yellow-green, with black pattern as follows: narrow stripe each on dorsum of fore and middle legs from basal half of femora to claws, broad outer band on apical 2/5 of hind femur, hind tibia except broad ring near apex, hind tarsus. Wings pale brown, subhyaline, vein C, R1 and most part of Sc+R of fore wing pale brown, anterior part of stigma pale, other part pale brown, other veins black brown.

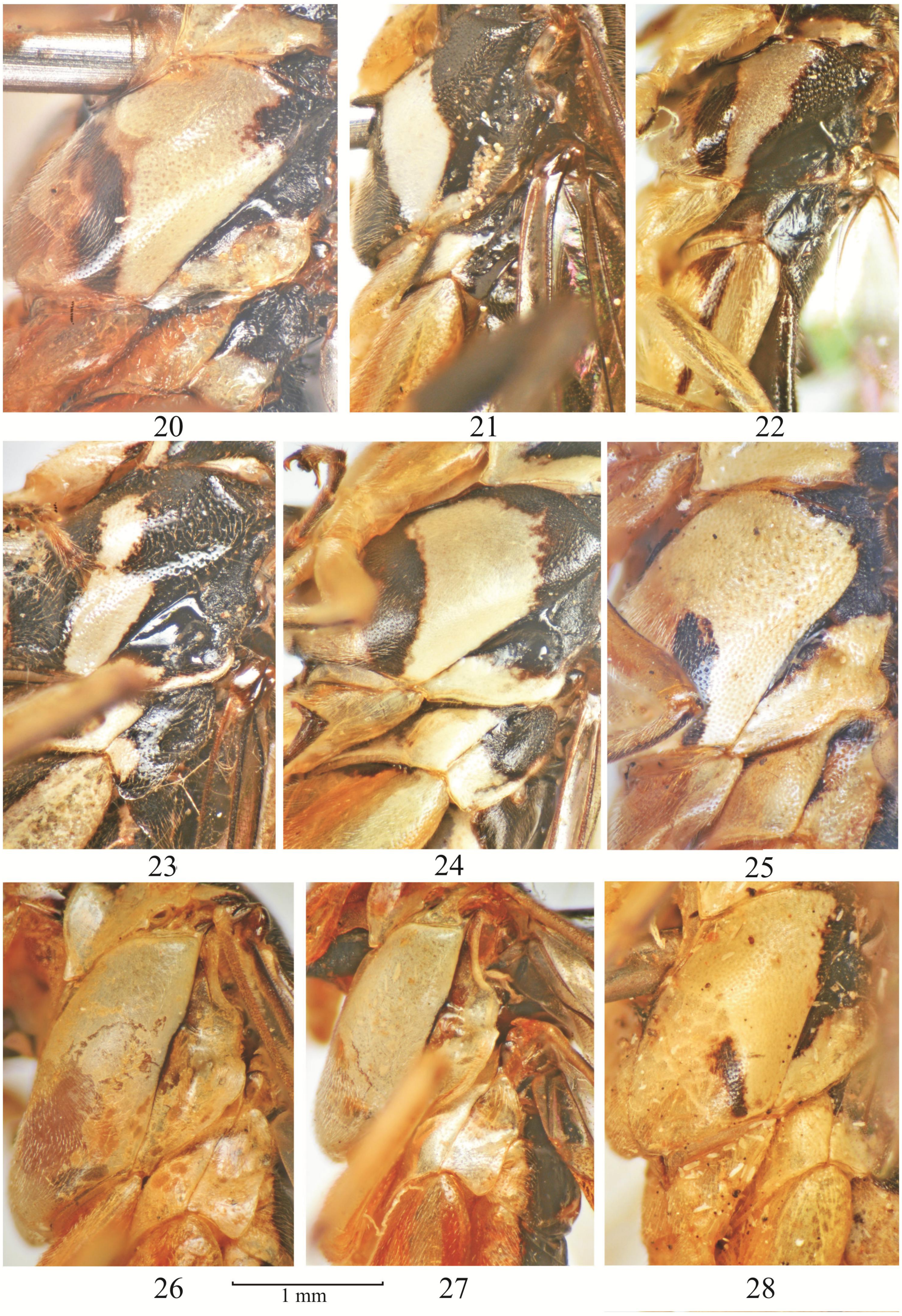
Punctures on labrum minute, indistinct, clypeus with a few large, shallow and scattered punctures; punctures on and around the frontal area minute and shallow, distance between punctures 1–2 times diameter of punctures, space between punctures polished, sculpture indistinct, strongly shining; punctures on mesonotum minute and shallow, slightly shining; punctures on upper mesepisternum larger than on frontal area, punctures on lower part minute and shallow, space between punctures smooth, with sculpture, strongly shining; anepimeron with distinct sculpture, luster absent, katepimeron smooth, punctures and sculpture indistinct, strongly shining; punctures on metepisternum minute, shallow and quite dense, slightly shining; metepimeron smooth, punctures shallow, scattered, strongly shining; mesepisternum and mesoscutellar appendage smooth, without punctures, sculpture indistinct, distinctly shining; punctures on terga as large as on frontal area, but quite scattered, space between punctures with sculpture and luster; outer hind coxa with dense and large punctures.



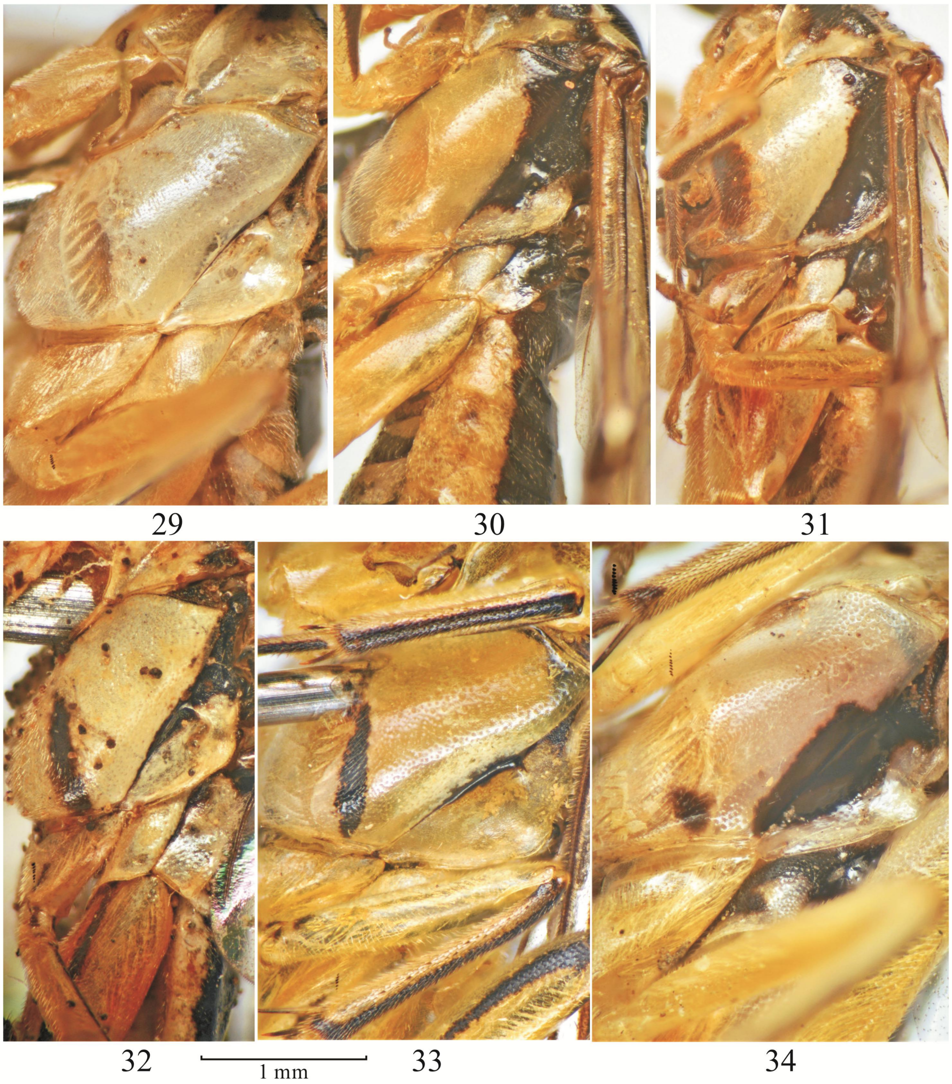
Figures. 1–9. Mesepisternum and mesepimeron in lateral view. 1. *P. motuoensis*, female, holotype; 2. *P. rapae*, female, specimen from German; 3. *P. rapae*, male, specimen from German; 4. *P. semenowi*, female, specimen from Tibet; 5. *P. caii*, female, holotype; 6. *P. lineatella*, female, holotype; 7. *P. melanogastera*, female, holotype; 8. *P. obscurodentella*, female, holotype; 9. *P. paramelanogastera*, female, holotype.



Figures 10–19. Mesepisternum and mesepimeron in lateral view. 10. *P. bimaculofemorata*, female, holotype; 11. *P. breviserrula*, female, holotype; 12. *P. erratica*, female, specimen from Zhejiang; 13. *P. libona*, female, holotype; 14. *P. lineipediba*, female, holotype; 15. *P. lini*, female, holotype; 16. *P. lini*, male, specimen from Guizhou; 17. *P. maculotibialis*, female, holotype; 18. *P. prismatiscutellum*, female, holotype; 19. *P. senjensis*, specimen from Hunan.



Figures 20–28. Mesepisternum and mesepimeron in lateral view. 20. *P. serii*, female, specimen from Jilin; 21. *P. songluanensis*, female, holotype; 22. *P. sunae*, male, holotype; 23. *P. tiani*, female, holotype; 24. *P. wulingensi*, female, holotype; 25. *P. albicincta*, female, specimen from Tibet; 26. *P. antennata*, female, specimen from German; 27. *P. antennata*, male, specimen from German; 28. *P. gregalis*, female, specimen from Zhejiang.



Figures 29–34. Mesepisternum and mesepimeron in lateral view. 29. *P*. *sellata*, female, specimen from Liaoning; 30. *P*. *simulans*, female, specimen from German; 31. *P*. *simulans*, male, specimen from German; 32. *P*. *subcoreacea*, female, specimen from Yunnan; 33. *P*. *zejiani*, female, holotype; 34. *P*. *neixiangensis*, male, holotype.

Anterior margin of labrum rounded; clypeus triangularly incised to 1/5 of its medial length, lateral lobe blunt; malar space 2.5 times diameter of median ocellus; inner margin of eyes divergent downwards; supra-antennal tubercle insignificant, frontal area flat, far below top of eyes in lateral view, frontal ridge slightly elevated; middle fovea ditch-shaped, shallow, but not reaching median ocella, lateral fovea quite shallow, indistinct; interocellar furrow shallow, postocellar furrow absent; postocellar area not elevated, with shallow middle furrow, about 1.7 times wider than long, lateral furrow shallow; head distinctly narrowed behind eyes in dorsal view. Antenna longer than combined length of thorax and abdomen, flagellomere 1 about 0.9 times length of flagellomere 2, flagellomeres strongly compressed. Mesoscutellum strongly elevated, lateral carina blunt, middle carina of mesoscutellar appendage blunt. Terga 6–8 deeply concave in middle (Fig. 44). Hind tarsomere 1 slightly longer than combined length of following 4 tarsomeres, claw with inner tooth slightly longer than outer tooth. Middle petiole of anal cell in fore wing distinctly shorter than half length of basal anal cell, as long as vein R+M; petiole of anal cell in hind wing quite long, slightly shorter than length of vein cu-a. Penis valve as in Fig. 71.

Female. Unknown.

Holotype. ♂, **China**, Hunan, Taoyuandong, 114°02.398′E, 26°29.366′N, alt. 900–1000 m, 24-IV-1999, Meicai WEI leg., CSCS; **Paratypes**. 2♂ with identical collection data.

Etymology. This species is named for its resemblance to the similar species, *P. Neixiangensis*.

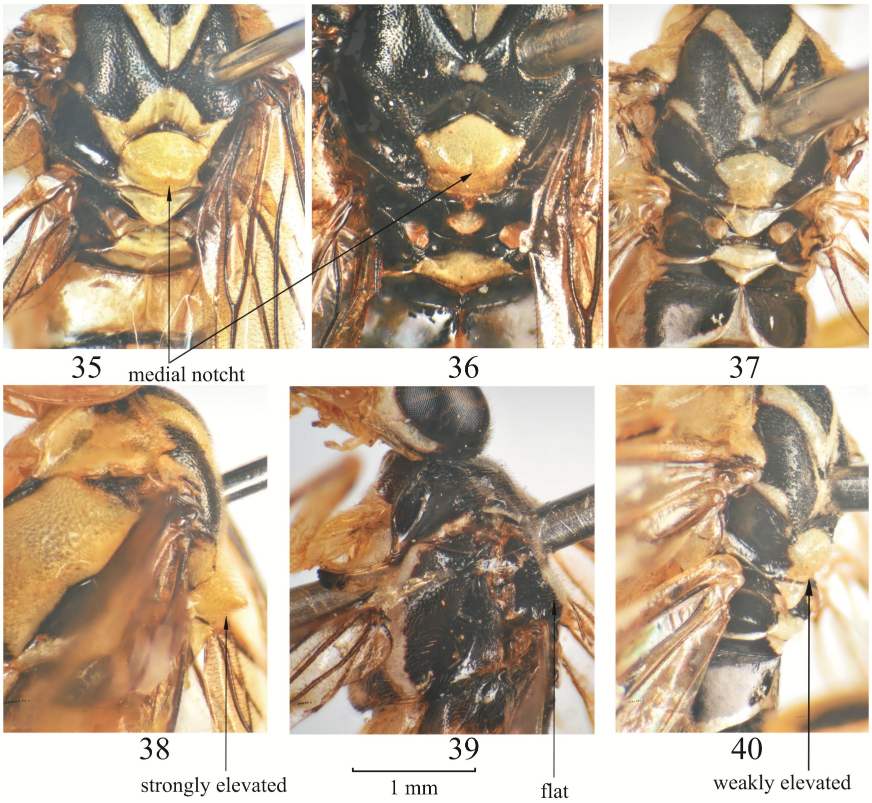
Remarks. This species is close to *P. neixiangensis* Wei & Zhong, 2007 in general appearance. In addition to the characters listed in the key, the following characters are characteristic of this species: the yellow-green part on mesonotum broad, punctures on upper mesepisternum minute and shallow. In latter species, the yellow-green part on mesonotum narrower than on *P. neixiangensis*, punctures on upper mesepisternum quite large and deep.

Distribution. China (Hunan).

3. ***Pachyprotasis prismatiscutellum*** **Zhong, Li & Wei sp. nov.** (Figs. 18, 35, 38, 54, 55, 58, 59, 61, 64)

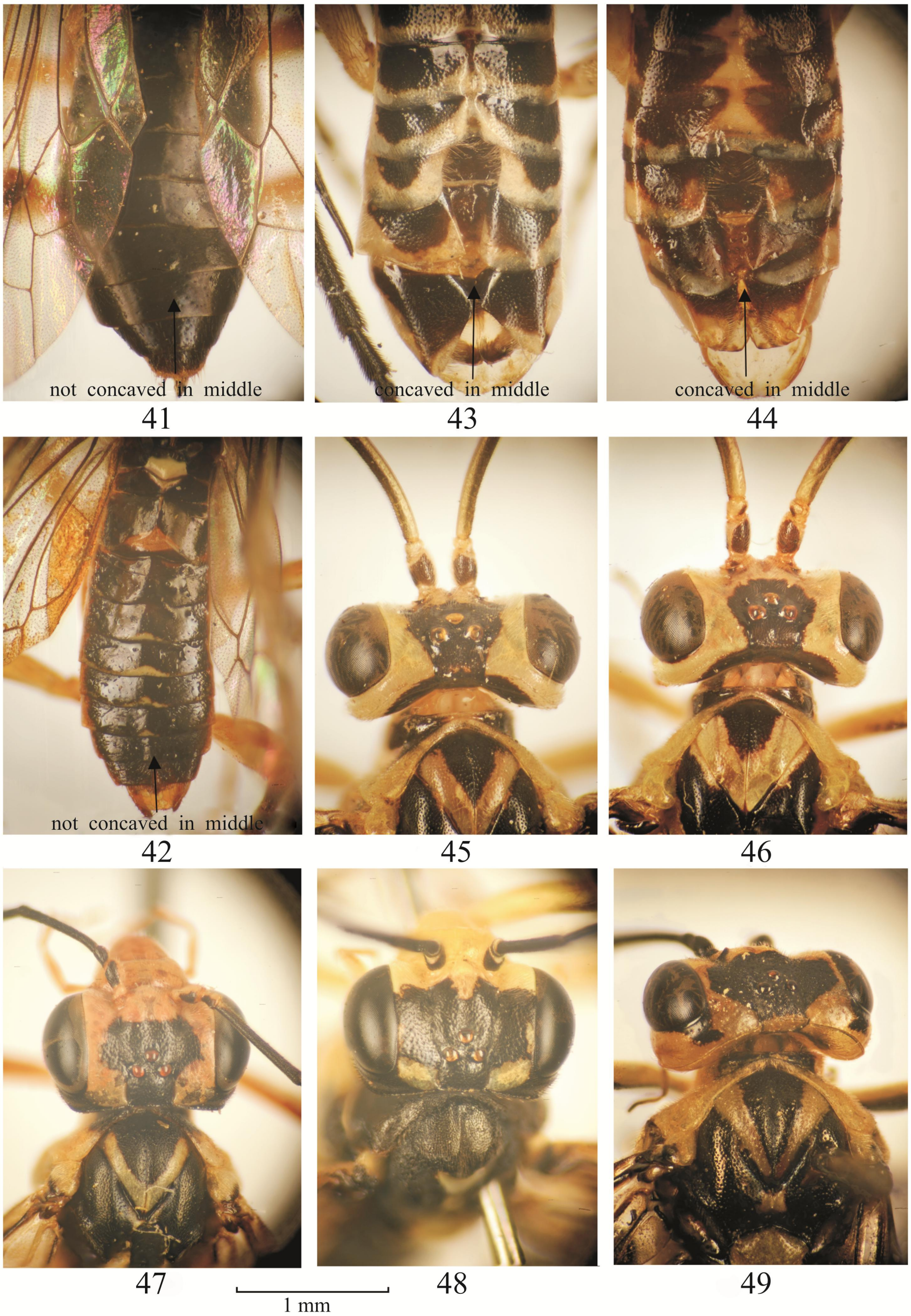
Female (Figs. 54, 55). Body length 8.5 mm. Head yellow-green, with black pattern as follows: posterior half of frons continuing with postocellar area, lateral fovea continuing with inner orbit, center of upper occiput, antenna except ventral side of scape, dorsal side of maxillary palpomere 3. Dorsum of body black, with yellow-green pattern as follows: pronotum except center, tegula except posterior margin, V-shaped spot on lateral side of median mesoscutal lobe, apex of lateral mesoscutal lobe, mesoscutellum, mesoscutellar appendage, metascutellum, tergum 1 and terga 8–10, medial triangular spot each on posterior of terga 2–7; venter of body yellow green, with black pattern as follows: large horizontal band on lower mesepisternum (Fig. 18), basal half of mesepimeron, lower 1/3 of metepisternum, basal half of metepimeron. Legs yellow green, with black pattern as follows: dorsal side of tibiae and tarsi of fore and middle legs, two separate spots on outer side of metatrochanter, metatibia and metatarsus. Wings pale brown, subhyaline, stigma and veins black brown.

Labrum and clypeus polished, with a few shallow and minute punctures; dorsum of head with dense, shallow and large punctures, interspaces with distinct sculpture and oily luster; punctures on mesonotum dense, interspaces polished, distinctly shining; punctures on upper mesepisternum large, coarse and dense, on lower part minute and dense, interspaces with sculpture, luster indistinct; anepimeron and dorsal half of katepimeron with distinct sculpture, mattte, ventral half of katepimeron smooth, shining; punctures on metepisternum shallow, minute and dense, luster indistinct; metepimeron polished, punctures minute, shallow and sparse, interspaces shining; mesoscutellum with shallow, minute and scattered punctures, shining; mesoscutellar appendage polished, punctures and sculpture indistinct, shining; terga with sparse, shallow and minute punctures, densely coriarious, weakly shining; punctures on outer side of hind coxa shallow, minute and dense.

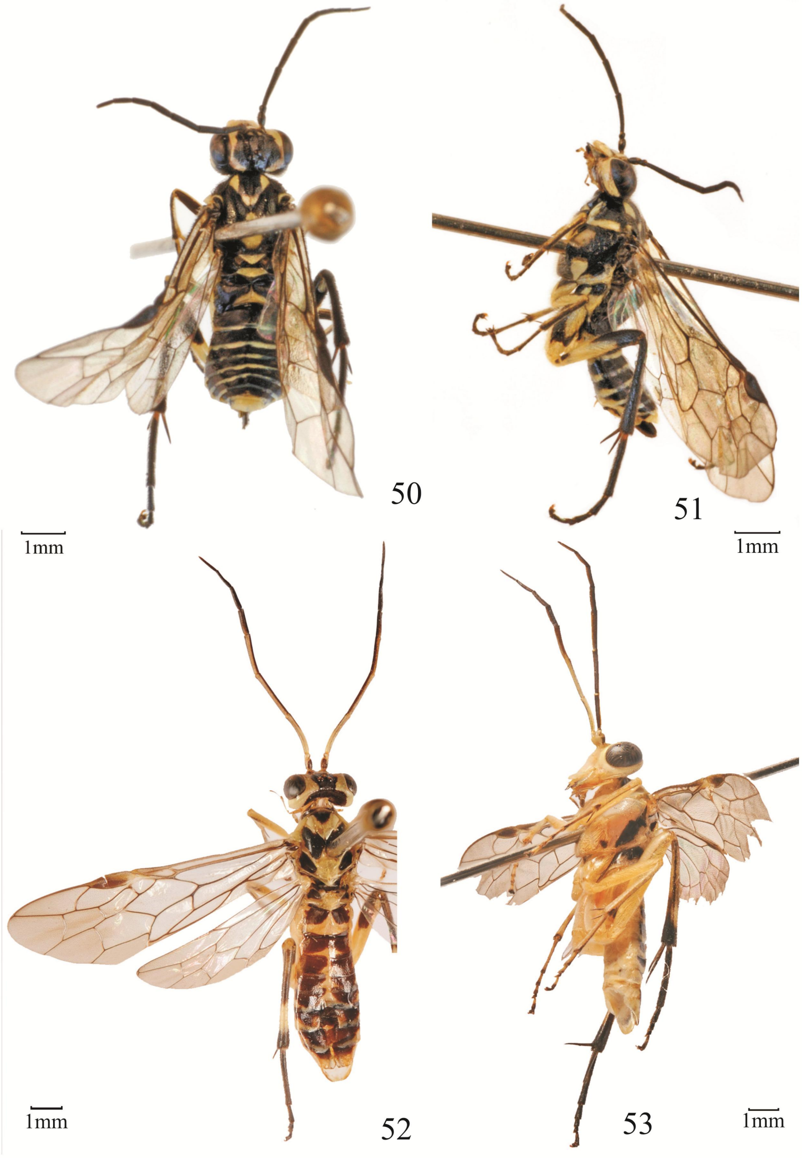


Figures 35–40. Mesoscutellum. 35. *P. prismatiscutellum*, female, in dorsal view, holotype; 36. *P. sulciscutellis*, female, dorsal view, holotype; 37. *P. sellata*, female, dorsal view, specimen from Liaoning; 38. *P. prismatiscutellum*, female, lateral view, holotype; 39. *P. maculotibialis*, female, lateral view, holotype; 40. *P. sellata*, female, lateral view, specimen from Liaoning.

Anterior margin of labrum truncate; clypeus incised to 0.3 of its medial length, lateral lobe blunt; malar space nearly 2 times diameter of median ocellus; inner margin of eyes indistinctly convergent downwards; supra-antennal tubercle insignificant, frontal area distinctly elevated, slightly below top of eyes in lateral view, frontal ridge rounded; middle and lateral foveae ditch-like, shallow; interocellar furrow broad and shallow, postocellar furrow absent; postocellar area weakly elevated, 1.8 times wider than long, lateral furrow deep and straight; head indistinctly narrowed behind eyes in dorsal view. Antenna as long as combined length of thorax and abdomen, flagellomere 1 about 1.1 times longer than flagellomere 2. Mesoscutellum strongly elevated, lateral carina acutely raised posteriorly to form two separated tubercles (Fig. 38), disc of mesoscutellum with medial notch (Fig. 35), middle carina of mesoscutellar appendage acute. Inner tibial spur of hind leg longer than 0.5 times length of hind tarsomere 1, hind tarsomere 1 distinctly longer than combined length of tarsomeres 2–5, claw with inner tooth as long as outer tooth. Vein cu-a in fore wing joining cell M at proximal 0.3, 2Rs distinctly longer than 1Rs, middle petiole of anal cell slightly longer than half length of basal anal cell, nearly 1.5 times length of vein R+M; petiole of anal cell in hind wing shorter than half length of vein cu-a.



Figures 41–49. Terga in dorsal view and head in dorsal view. 41. *P. antennata*, female, terga, dorsal view, specimen from German; 42. *P. antennata*, male, terga, dorsal view, specimen from German; 43. *P. neixiangensis*, male, terga, dorsal view, holotype; 44. *P. paraneixiangensis*, male, terga, dorsal view, holotype; 45. *P. neixiangensis*, male, head, dorsal view, holotype; 46. *P. paraneixiangensis*, male, head, dorsal view, holotype; 47. *P. antennata*, female, head, dorsal view, specimen from German; 48. *P. lui*, female, head, dorsal view, holotype; 49. *P. zejiani*, female, head, dorsal view, holotype.

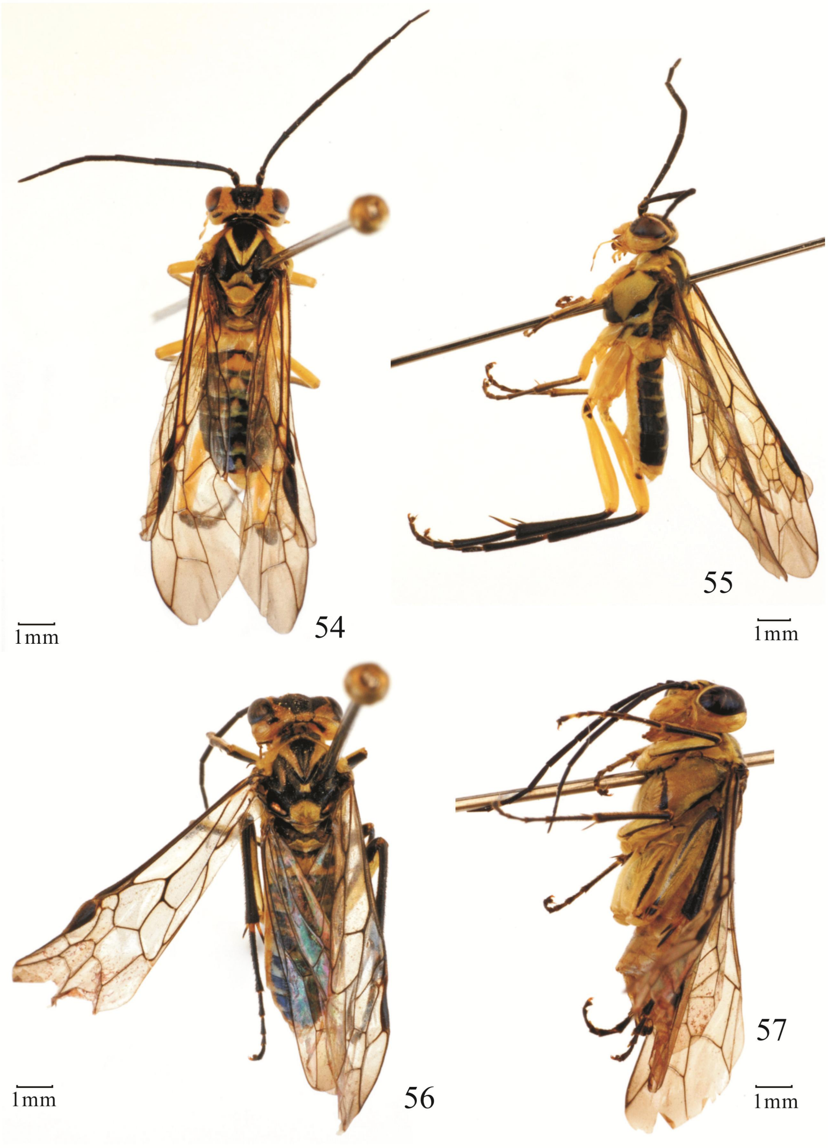


Figures 50–53. *P. motuoensis* and *P. paraneixiangensis*, adult. 50. *P. motuoensis*, female, dorsal view, holotype; 51. *P. motuoensis*, female, lateral view, holotype; 52. *P. paraneixiangensis*, male, dorsal view, holotype; 53. *P. paraneixiangensis*, male, lateral view, holotype.

Ovipositor sheath distinctly shorter than hind tarsomere 1 in lateral view, valvula 3 rounded at apex and longer than valvifer 2 in lateral view. Lancet with 20 annuli (Fig. 61), base of each serrula not elevated, middle serrulae each with 1 basal denticle and 8–10 distal denticles (Fig. 64).

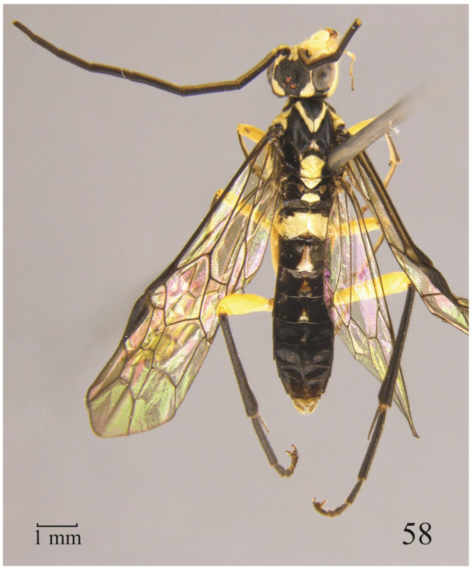
Male (Figs. 58, 59) (only differences from female described). Body length 7.5 mm. Ventral side of antenna yellow-green, pale stripe becoming narrower towards tip of antenna.

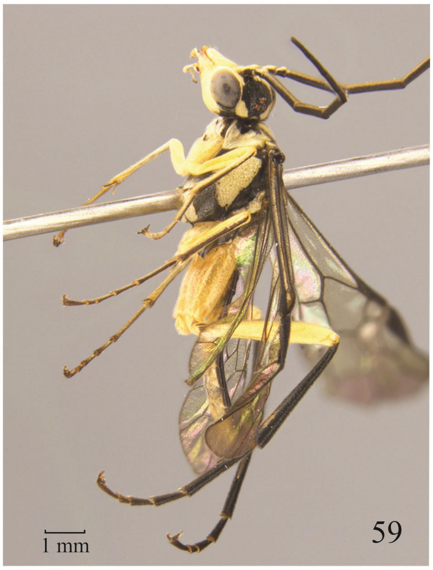
Medial triangular spot present on terga 2–4, terga 5–7 indistinctly brown medially. Femora of fore and middle legs with small infuscated spot apically, metatibia with brown preapical spiot ventrally.



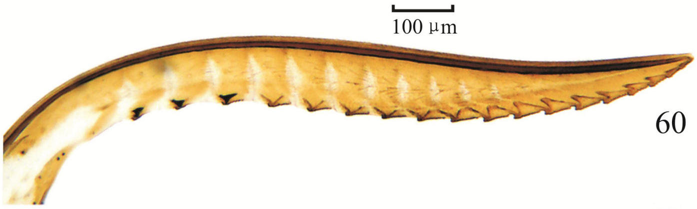
Figures 54–57. *P. prismatiscutellum* and *P. zejiani*, adult. 54. *P. prismatiscutellum*, female, dorsal view, holotype; 55. *P. prismatiscutellum*, female, lateral view, holotype; 56. *P. zejiani*, female, dorsal view, holotype; 57. *P. zejiani*, female, lateral view, holotype.

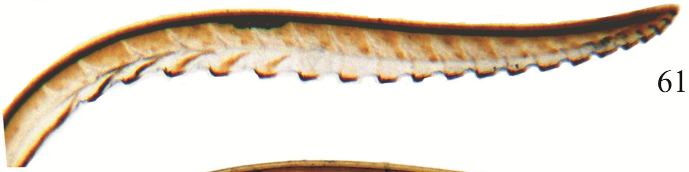
Punctures on mesonotum dense, interspaces coriarious, lateral lobe more distinctly shining than medial lobe. Anterior margin of labrum shallowly rounded; clypeus roundly excised for 0.15 of its medial length; malar space 1.7 times diameter of median ocellus; dorsal section of inner margins of eyes weakly convergent downwards, ventral section subparallel; postocellar area 2.3 times wider than long; head narrowed behind eyes in dorsal view. Antenna as long as complete body. Inner tibial spur of hind leg longer than 0.5 times length of hind tarsomere 1, hind tarsomere 1 0.9 times as long as combined length of tarsomeres 2–5.

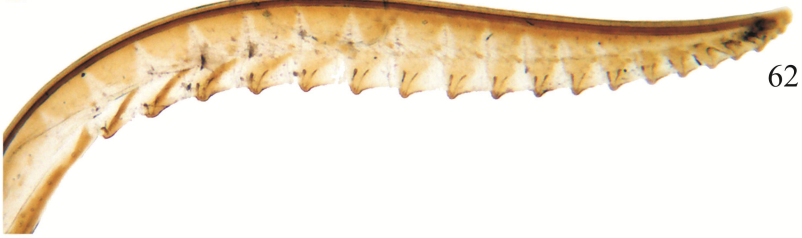




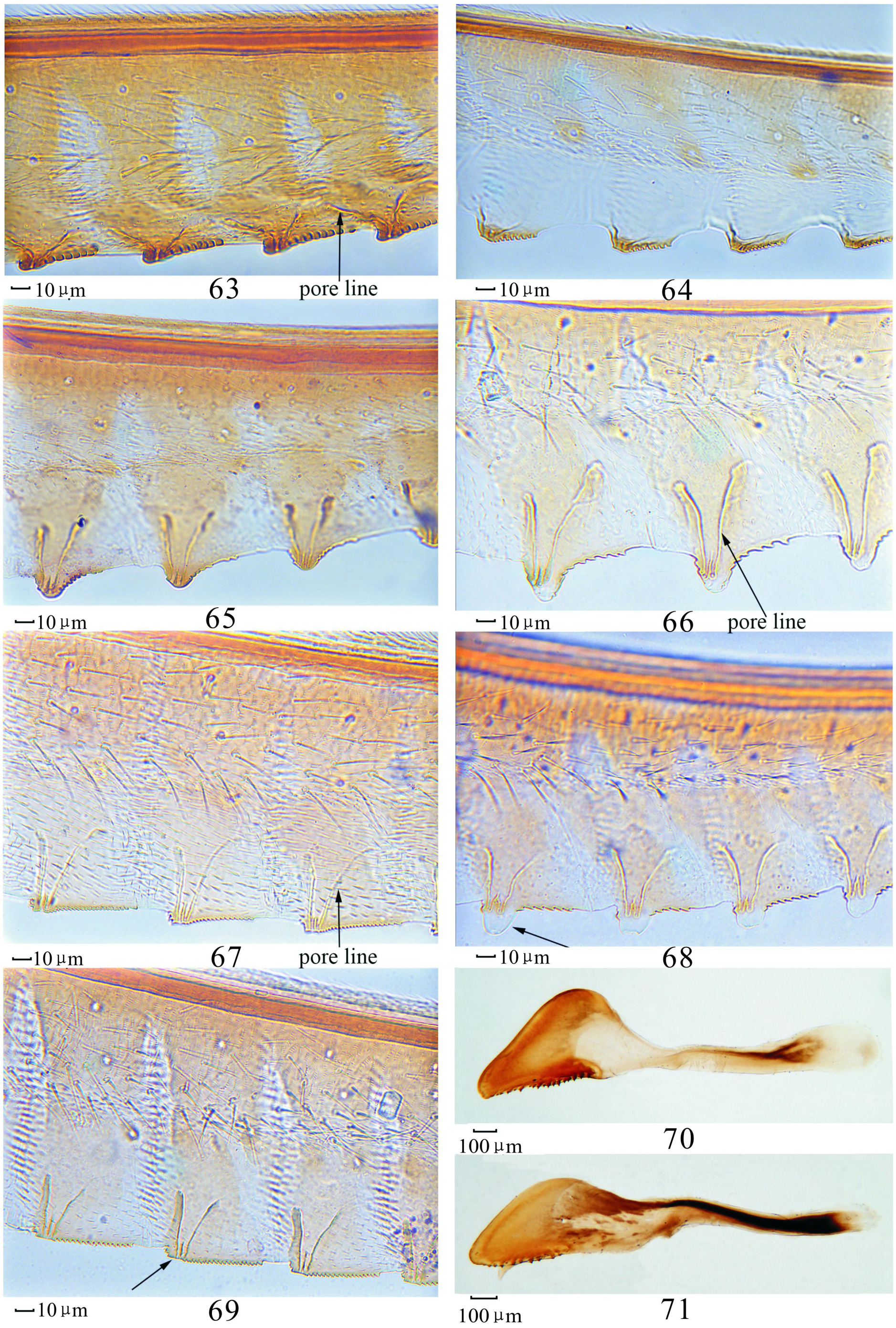
Figures 58–59. *P. prismatiscutellum*, adult. 58. *P. prismatiscutellum*, male, dorsal view; 59. *P. prismatiscutellum*, lateral view (Taken by Andreas Taeger).







Figures 60–62. *Pachyprotasis*, spp., holotype. Lancet. 60. *P. motuoensis*; 61. *P. prismatiscutellum*; 62. *P. zejiani*.



Figures 63–71. *Pachyprotasis*, spp., holotype, middle serrulae and penis valve. 63. *P. motuoensis*, middle serrulae; 64. *P. prismatiscutellum*, middle serrulae; 65. *P. zejiani*, middle serrulae; 66. *P. rapae*, middle serrulae; 67. *P. semenowi*, middle serrulae; 68. *P. senjensis*, middle serrulae; 69. *P. tiani*, middle serrulae; 70. *P. neixiangensis*, penis valve; 71. *P. paraneixiangensis*, penis valve.

Holotype. ♀, **China**, Yunnan, Mt. Gongshan, Heiwadi, 98º40.060′E, 27º44.330′N, alt. 2100 m, 10-VI-2009, Yihai ZHONG leg., CSCS; **Paratypes**. 1♀, **China**, Yunnan, Tengchong County, Mt. Gaoligongshan, 98º46.062′E, 24º49.700′N, alt. 2500–3200 m, 07-VII-2005, Shouzhu LIU leg.; 1♀, **China**, Yunnan, Lushui County, Yaojiaping, 98º42.508′E, 25º57.233′N, alt. 2550 m, 03-VI-2009, Yihai ZHONG leg.; 1♀, **China**, Yunnan, Pianma environs, 98º42.480′E, 25º58.380′N, alt. 2500 m, 03-VI-2009, Blank, Liston & Taeger leg., deposited in SDEI; 1♂, **China**, Yunnan, Mt. Gongshan, 18 km NW, 98º30.180′E, 27º47.880′N, alt. 3000 m, 11-VI-2009, Blank, Taeger & Liston leg., deposited in SDEI.

Etymology. The specific epithet, a noun, refers to the prismatically shaped mesoscutellum.

Remarks. This species is distinct from other species of the *rapae* group by the following characters: mesoscutellum strongly elevated, lateral carina acutely raised posteriorly to form two separated tubercles; metacoxa and metafemur yellow green without black spot; metatrochanter yellow green with two small black spots on outer side; tergum 1 completely yellow-green; mesepisternum yellow-green, lower part with large horizontal black band; punctures on upper mesepisternum large, coarse and dense.

Distribution. China (Yunnan).

4. ***Pachyprotasis zejiani* Zhong, Li & Wei sp. nov.** (Figs. 33, 49, 56, 57, 62, 65)

Female (Figs. 56, 57). Body length 9.5 mm. Head yellow green, with black pattern as follows: posterior half of frons continuing with postocellar area, lateral fovea continuing with inner orbit, spot on vertex, lower margin of occiput (Fig. 49), antenna. Dorsum of body black, with yellow-green pattern as follows: pronotum except center, tegula except posterior margin, V-shaped spot on lateral side of median mesoscutal lobe, small medial spot on lateral mesoscutal lobe, mesoscutellum, mesoscutellar appendage, metascutellum, metapostnotum, posterior margins of all terga; venter of body yellow-green, with black pattern as follows: an extremely narrow horizontal band on lower mesepisternum, pleural suture (Fig. 33), apex and upper margin of valvula 3. Legs yellow-green, with black pattern as follows: dorsum of four front legs from trochanter to claw, stripe on outer hind leg from base of coxa to apex of femur, metatibia and metatarsus completely. Wings hyaline, stigma and veins black brown.

Labrum and clypeus polished, punctures minute, shallow and sparse; dorsum of head with shallow and rather larger punctures, interspaces with distinct sculpture, matte; mesonotum minutely and moderately punctured, shining; punctures on upper mesepisternum large and deep, on lower part minute and dense, interspaces polished, distinctly shining; mesepimeron with distinct sculpture, luster indistinct; punctures on metapleuron shallow, minute and dense, luster indistinct; center of mesoscutellum polished without punctures, laterally with shallow and large punctures, luster indistinct; mesoscutellar appendage polished, punctures and sculpture indistinct, strongly shining; terga with sparse, shallow and minute punctures, sculpture dense, shining; punctures on outer hind coxa shallow, minute and sparse.

Anterior margin of labrum rounded; clypeus truncately incised to about 0.3 of its medial length, lateral lobe blunt; malar space 1.5 times diameter of median ocellus; inner margin of eyes convergent downwards; supra-antennal tubercle insignificant, frontal area distinctly elevated, slightly below top of eyes in lateral view, frontal ridge lowly rounded; middle fovea shallow, lateral furrow pit-like, deep; interocellar furrow shallow, postocellar furrow absent;

postocellar area elevated, 2 times wider than long, lateral furrow deep; head distinctly narrowed behind eyes in dorsal view. Antenna shorter than combined length of thorax and abdomen, flagellomere 1 about 1.2 times longer than length of flagellomere 2. Mesoscutellum bluntly elevated, lateral carina blunt, middle carina of mesoscutellar appendage acute. Inner tibial spur of hind leg longer than 0.5 times length of hind tarsomere 1, hind tarsomere 1 shorter than combined length of following 4 tarsomeres, claw with inner tooth shorter than outer tooth. Vein cu-a in fore wing joining cell M at proximal 0.4, 2Rs as long as 1Rs, middle petiole of anal cell shorter than half length of basal anal cell, as long as vein R+M; petiole of anal cell in hind wing as long as half length of vein cu-a.

Ovipositor sheath distinctly shorter than hind tarsomere 1 in lateral view, valvula 3 rounded at apex and about 1.4 times length of valvifer 2 in lateral view. Lancet with 22 annuli (Fig. 62), base of each serrula distinctly elevated, middle serrulae each with 2 basal denticles and 6–9 distal denticles (Fig. 65).

Male. Unknown.

Holotype. ♀, **China**, Sichuan, Shiqu County, Mt. Que′ershan, 98º48.697′ E, 32º13.920′ N, alt. 3804 m, 29-VI-2009, Zejian LI leg., CSCS; **Paratypes**. 1♀, **China**, Sichuan, Luding County, Yajiageng River, 102º01.193′ E, 29º52.877′ N, alt. 3646 m, 04-VII-2009, Zejian LI leg.; 1♀, **China**, Qinghai, Nangqian County, 96º30.757′ E, 31º58.399′ N, alt. 4288 m, 25-VI-2009, Meicai WEI & Zejian LI leg.

Etymology. This species is named after the collector of the holotype.

Remarks. This species is close to *P. subcoreaceus* Malaise, 1945 in general appearance. In addition to the characters listed in the key, the following characters are characteristic for this species: punctures on upper mesepisternum large and deep; middle serrulae each with 2 basal denticles and 8–10 distal denticles. (In latter species punctures on upper mesepisternum minute and shallow; basal and distal denticles on middle serrulae absent or indistinct.)

Distribution. China (Sichuan, Qinghai).

Acknowledgments

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